

### **REMARKS/ARGUMENTS**

Claims 1-19 are currently pending in the present application. Claims 1-19 have been amended for minor editorial purposes, and not to further limit the scope of these claims. Claim 6 has also been re-produced and amended to show the phrase previously deleted, as requested by the Examiner. These amendments are supported by the claims and specification, as originally filed. No new matter has been added.

Reconsideration of the application is respectfully requested in view of the following remarks.

### **Rejection under 35 U.S.C. § 102(b)**

The rejection of claims 1 and 2 under 35U.S.C. § 102 (b) of claim 1 and 2 as anticipated by Metz et al. (U.S. Patent No. 5,767,303) is respectfully traversed.

The reference does not describe or suggest a process for preparing haloalkanes by reacting alcohols with hydrogen halides in the presence of an ionic liquid, according to the claimed invention.

As the Office is aware, anticipation requires the disclosure, in a reference, of “each and every element” recited in the claims. MPEP § 2131, citing *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). There must be no difference between the claimed invention and reference disclosure for an anticipation rejection under 35 U.S.C. 102. See *Scripps Clinic and Res. Found. v. Genentech, Inc.*, 927 F.2d 1565, 1576, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991).

Turning to present claim 1, the process recites, *inter alia*,

- a) a reaction of the alcohol with the hydrogen halide in the presence of an ionic liquid;
- b) at a temperature above 100°C for at least part of the time; and
- c) the water content is not more than 25 mol % based on the amount of ionic liquid (at least at the time of commencement of the reaction), in which
- d) the ionic liquid is not octyltrimethylammonium chloride.

Applicants note that the claimed process provides an improved space-time yield, and an improved yield and purity of the products and/or the conversion thereof. *See* page 3, lines 15-20 of the present specification. These advantages are shown by the non-limiting Examples provided in the present specification, in which a high purity haloalkane, i.e., 1,6-dichlorohexane, is prepared.

For instance, Examples 2-4 represent a process according to the claimed invention. *See* page 18, line 27 to page 19, line 5 of the present specification. In particular, in these Examples, the ionic liquid is placed in a reactor together with the alcohol and heated to 135°C. Hydrogen chloride is passed in, and the absorption of the hydrogen chloride is monitored.

In Table 1 on page 19 of the present specification, the duration of hydrogen halide absorptions are listed. Table 1 is reproduced below.

TABLE 1

Example	Base/ionic liquid	Amount of water	Duration of HCl absorption (min:sec)		
			500 ml	1000 ml	1500 ml
2	1-methylimidazole	—	0:28	1:01	1:54
3	2-ethylpyridine	—	0:25	0:56	1:42
4	1-ethyl-3-methyl- imidazolium chloride	—	0:19	0:40	1:06

In Table 2 on page 19 of the present specification (Comparative Examples), the duration of absorptions of hydrogen halides is shown for ionic liquids with an increased amount of water according to the state of the art. *See also* page 3, lines 4-20 of the present specification. In particular, in addition to the base or ionic liquid, the amount of water indicated in Table 2 (based on the ionic liquid) is initially placed in the reaction vessel and the solution is subsequently saturated with hydrogen chloride. Table 2 is reproduced below.

TABLE 2

Comparative		Amount of water [mol]	Duration of HCl absorption (min:sec)		
Example	Base/ionic liquid		500 ml	1000 ml	1500 ml
C2	1-methylimidazole	0.5	1:07	2:13	4:13
C3	2-ethylpyridine	1	0:35	1:29	2:55
C4A	1-ethyl-3-methyl-imidazolium chloride	0.5	1:01	1:35	2:20
C4B	1-ethyl-3-methyl-imidazolium chloride	1	1:03	2:33	4:50
C5	tri-n-butylamine	1	0:42	1:53	4:55

Applicant notes that in both Tables 1 and 2, the duration of hydrogen halide absorption is a measure of the reaction rate.

From a comparison of above-shown Tables 1 and 2, it can be seen that the reaction occurs significantly faster in the process of the claimed invention. Moreover, these Examples show that when the ionic liquid is used in the initial absence of water and temperatures of above 100°C no appreciable slowing of the reaction rate is observed, despite an increasing amount of water in the reaction.

Furthermore, Examples 5 and 7 of the present specification also show the improved results obtained by the claimed process, i.e., improved selectivity and improved conversion. By comparison, Example 6, which is carried out in the initial presence of water, shows that the use of ionic liquid in an aqueous phase leads to a significantly reduced conversion to the desired end-product.

In contrast to the claimed invention, Metz et al. generally describes a process for preparing haloalkanes by reacting the corresponding alcohol with hydrogen chloride in the presence of an *aqueous* alkylpyridine hydrochloride solution. Additionally, concentrated (aqueous) hydrochloric acid is added in the process. See column 1, lines 59-63, and column 2, lines 12-17 of Metz et al. Applicant notes that EP-A 0 789 013, a European counterpart to Metz et al., is generally discussed and distinguished at page 1, lines 22-27 of the present specification.

For instance, as shown in Example 2 (“Continuous Preparation of 1,6-dichlorohexane”), Metz et al. describes the reaction of 1, 3-dichlorohexane in the presence of an *aqueous* alkylpyridine hydrochloride solution, under the addition of hydrogen chloride and concentrated (aqueous) hydrochloric acid (the ratio of diol to hydrochloric acid is 0.6:1). *See* column 3, lines 29-31 of Metz et al. (reciting that “an aqueous alkylpyridine hydrochloride solution [is] introduced into the glass reactor (A), and . . . hydrogen chloride and concentrated hydrochloric acid . . . [are] added via the submerge tube (3)”).

Applicant notes that Example 2 of Metz et al. is similar to the process of the Comparative Examples of the present specification. *See* Table 2, discussed *supra*. In particular, as discussed *supra*, there is an initial presence of water in the reaction vessel (based on the ionic liquid) in the Comparative Examples, in which the solution is subsequently saturated with hydrogen chloride.

As such, the process and conditions described in Metz et al. are entirely different from the claimed process. In addition, there is no suggestion of the claimed invention, since the Comparative Examples (similar to Example 2 in the reference) show that the improved results are not obtained.

Therefore, for at least these reasons, the claimed invention is novel and unobvious over Metz et al. Accordingly, withdrawal of the rejection is requested.

#### **Rejection under 35 U.S.C. § 103(a)**

The rejection of claims 1-19 under 35 U.S.C. § 103(a) as obvious over Metz et al. in view of Ren et al. (Organic Letters, 2001, vol. 3, no. 23, pp. 3727-3728), Winkler et al. (U.S. Patent No. 5,202,513), and Leadbeater et al. (Tetrahedron, 35/5/2003, vol. 59, pp. 2254-2255, 2257) is respectfully traversed.

As discussed above, Metz et al. does not describe or suggest all of the components and conditions of present claim 1. Further, there is no suggestion or apparent reason to modify the reference in the manner presently claimed. *See* MPEP § 2143 (reciting the required three basic criteria for establishing a prima facie case of obviousness); *see also KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1741 (2007) (“*KSR*”) (the Supreme Court explaining that there must be “a reason that would have prompted a person of ordinary skill in the relevant field to

combine the elements in the way the claimed new invention does,” and indicating that this reason must be “apparent”); *Takeda Chem. Indus., v. Alphapharm Pty. Ltd.*, 492 F.3d 1350, 1356-57 (Fed. Cir. 2007) (“*Takeda*”) (the Federal Circuit concurring with the reasoning in *KSR* by also emphasizing that there must be some identified reason that would have “prompted” a chemist to make a modification in a particular manner to establish *prima facie* obviousness).

Regarding Ren et al., the reference is generally discussed and distinguished in the present specification at page 2, lines 9-13. In particular, according to the disclosure of Ren et al., a reaction of n-butyl alcohol in the presence of ionic liquid hydrochloric acid does not occur. Therefore, the reference does not cure the deficiencies of Metz et al., and there is no indication that one would be prompted piece together the claimed invention based on its disclosure.

Regarding Winkler et al., a European counterpart to the reference, EP-A 0 428 166, is generally discussed and distinguished in the present specification at page 1, lines 16-20 of the present specification. In particular, Winkler et al. describes a process for the preparation of haloalkanes in the presence of amine hydrochlorides in an *aqueous* solution. Therefore, the reference clearly does not suggest the claimed invention or cure the deficiencies of the Metz et al. disclosure.

Regarding Leadbeater et al., the reference generally relates to a process of preparing haloalkanes by microwave radiation of alcohols in the presence of ionic liquids and sulphuric acid or p-toluene sulfonic acid. In the disclosed process, there is no description or indication of the use of hydrogen halides. As such, the process is not only generally different from the claimed invention, but it also clearly excludes at least one component. Therefore, one would not be prompted to rely on its disclosure to achieve the claimed invention.

Therefore, the claimed invention is not obvious over Metz et al., alone or in combination with the above-discussed references. Accordingly, withdrawal of the rejection is requested.

**Claim Objection**

The objection to claim 6 is obviated by amendment, in view of the amendment shown and discussed above.

**Information Disclosure Statement**

The Information Disclosure Statement filed on May 5, 2006 has been re-submitted with the foreign references and non-patent literature references previously not provided, as requested by the Examiner in the present Office Action at page 2, paragraph 1. The Examiner's acknowledgement and consideration of the references is respectfully requested.

In view of the above remarks and amendment, Applicants believe the pending application is in condition for allowance.

In the event the Examiner believes an interview might serve in any way to advance the prosecution of this application, the undersigned is available at the telephone number noted below.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 22-0185, under Order No. 13156-00041-US1 from which the undersigned is authorized to draw.

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Respectfully submitted,

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